Assessing Pedagogical Balance in a Simulated Classroom Environment

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Abstract

simSchool, an online simulator that has been used to enhance teacher preparation since 2003, models different types of students and provides virtual practice sessions for teachers to assign tasks and interact with students. In this article the authors (a) examine changes in preservice teacher perceptions of teaching confidence and teaching experience resulting from simSchool use, and (b) report findings from recent studies of a new proposed measure for simSchool data, pedagogical balance. Pedagogical balance is a difference score that measures preservice teachers' self-reported levels of confidence minus experience, which indicates a level of alignment in self-evaluation when balancing one's perceptions of capabilities and experience. Findings from two studies show that preservice teachers significantly ($p < .05$) *improve pedagogical balance and increase awareness of effective teaching skills through simSchool training.*

Teaching is the most important factor of student achievement (National Commission on Teaching and America's Future, 1996), and effective teaching can increase student achievement outcomes (Darling-Hammond, Wei, Andree, Richardson, & Orphanos, 2009). The National Council of Accreditation of Teacher Education (NCATE) describes teaching effectiveness as

> teacher preparation/knowledge of teaching and learning, subject matter knowledge, experience, and the combined set of qualifications measured by teacher licensure as leading factors in teacher effectiveness. (Darling-Hammond, 2006)

In addition to having a positive impact on student learning, well-prepared teachers are also more likely to remain in teaching (according to NCATE). However, preparation programs do not seem to be able to produce enough well-prepared teachers. Attrition among beginning teachers has increased steadily over the past two decades (Ingersoll & Merrill, 2013), and more than 42% of new teachers leave the field within 5 years of entry (Perda, 2013). Borman and Dowling (2008) found that teachers with advanced degrees and with degrees in mathematics or science are more likely to leave teaching. In counterpoint to these trends, a recent study by Ingersoll, Merrill, and May (2014) examined the relationship between beginning teachers' education preparation and attrition. Findings showed that those teachers with more pedagogical preparation were more likely to stay in teaching, whereas those with less pedagogical preparation were more likely to leave the field after their first year of teaching. Mathematics and science teachers in their study had more subject-area coursework but less pedagogical coursework (Ingersoll et al., 2014). Among the strategies that may be useful for increasing pedagogical practice is the use of simulations such as simSchool, which provides an Internet-based simulated classroom that allows preservice teachers to experience the outcomes of instructional decisions. simSchool has more than 13,000 registered users in more than 156 countries (simSchool, 2015). The use of simSchool has been shown to demonstrate benefits to teacher preparation candidates in the areas of classroom management (Christensen et al., 2007), teaching skills (D. Gibson, Christensen, Tyler-Wood, & Knezek, 2011; Tyler-Wood, Knezek, & Christensen, 2007), motivation (Tyler-Wood et al., 2007), and instructional self-efficacy (Christensen, Knezek, Tyler-Wood, & Gibson, 2011; Knezek & Christensen, 2009). The study reported here explores the impact of simSchool on a new measure—pedagogical balance—as a proficiency indicator to enable students to understand the balance between estimations of their confidence and experience. Pedagogical balance is defined as the difference between a teacher's confidence and experience ratings for teaching (Hopper, Knezek, & Christensen, 2013; Hopper, Knezek, Christensen, Tyler-Wood, & Gibson, 2014). The pedagogical balance score may assist teacher educators by facilitating an understanding of candidates' perceptions of their teaching preparedness.

Research Questions

The purposes of this article are to examine changes in preservice teacher perceptions of teaching confidence and teaching experience and report findings from two studies of simSchool that include the new measure of pedagogical balance. A measure of self-efficacy evaluates both an affirmation of a capability level and the strength of that belief (Bandura, 1994). Teaching self-efficacy as measured here uses self-reported perceptions of teaching confidence and teaching experience. The teacher's confidence

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rating is taken to be an affirmation of a capability level and the strength of that belief is understood to be measured by the teacher's rating of experience. Experience according to Bandura can be gained through four sources:

- Successful repetition of a task.
- Social modeling through the observation of others completing a task.
- Social persuasion by competent others instilling confidence with encouragement to succeed.
- Situations for others to succeed through self-improvement (1994).

Research questions to be addressed are:

1. Does the use of simSchool influence preservice educators' self-perceptions of confidence in their teaching skills?
2. Does the use of simSchool influence preservice educators' self-perceptions of teaching experience?
3. Does the use of simSchool help bring into balance preservice educators' perceptions of teaching experience and confidence?

Conceptual Foundations

The concepts of self-efficacy (Bandura, 1994) and theory of action (Argryis & Schon, 1974) offer foundational ideas and rationales for the analysis of simSchool outcomes.

Self-Efficacy

Bandura (1994) indicates that students entering teacher education programs come with preconceived beliefs about education based on their own school experiences. Preservice teachers have acquired knowledge about schools, classrooms, and instructional practices from their 13 years of formal education (Lortie, 1975). From these experiences, preservice teachers have formed perceptions about their abilities to teach (Duffin, French, & Patrick, 2012 ;Woolfolk Hoy & Murphy, 2001). When preservice teachers begin a teacher education program, they participate in many new learning experiences (Cochran-Smith & Zeichner, 2005). The combination of these preconceived beliefs, perceptions, and new learning experiences is different for every preservice teacher and forms the foundation of teaching self-efficacy (Henson, 2001).

Bandura (1994) defines self-efficacy as one's belief in one's ability to succeed in a particular situation. A teacher's sense of self-efficacy affects that teacher's attitudes and feelings toward the educational process (Woolfolk Hoy & Hoy, 1990) and refers to a teacher's ability to carry out instructional practices in the educational context that result in positive student outcomes (Bandura, 1997). Noncognitive variables including persistence (S. Gibson & Dembo, 1984), motivation (Darling-Hammond, Chung, & Frelow, 2002), and organizational practices (Allinder, 1994) influence the attitudes and beliefs of a teacher's sense of instructional self-efficacy.

Previous studies using simSchool as an intervention for preservice teachers have reported large gains of self-reported teaching skill level or instructional self-efficacy. In a study of 32 preservice teacher candidates, from a reading/language arts methods course, at a large Southwestern university, students participated in nine hours of simSchool training. Findings in the area of instructional self-efficacy resulted in pre–post gains for the treatment group (effect size = .96) that were greater than the gain for the comparison group (effect size = .40) (Christensen et al., 2011).

Gains in instructional self-efficacy were reported in a study of 104 preservice teachers who explored how to accommodate the learning needs of a simulated student with disabilities in an inclusion classroom setting. The effect size was large for the treatment group ($d = .68$, $p = .03$), whereas the comparison group made no significant gains in self-efficacy. Findings showed that simSchool activities resulted in gains in instructional self-efficacy (Christensen et al., 2011).

Listed in Table 1 are Bandura's four skills related to gain in self-efficacy correlated with corresponding activities performed when using simSchool.

Theory of Action

Student teachers may underestimate the complexity of managing student behavior and student learning. The realities of teaching may cause student teachers to become dismayed with the gap between the expectations of their own abilities and their actual performance in the classroom with students (Tschannen-Moran et al., 1998). Argyris and Schon (1974) proposed two aspects of a theory of action—"espoused theory" and "theory in use"—that may explain why the gap between expectations and abilities occurs with the student teachers. An espoused theory is how people say they would like to or believe they will behave based on their personal values. A theory in use, in contrast, is how individuals actually behave in spite of their personally espoused values and can be inferred from action. The espoused theory may be the predominant theory under which optimistic student teachers are functioning when they are challenged with difficult classroom situations while student teaching. Many individuals are likely unaware that the behaviors in which they actually engage may be different from the behaviors they espouse. Even fewer individuals are aware of the actual theories under which they operate, leading to gaps between what student teachers say they do (or intend to do) and what they actually do (Argyris, 1980).

Literature Review

The literature relevant to the simSchool interventions studied for this article fall under the categories of preparedness to teach and the foundations of the simulation's model scenarios.

Preparedness to Teach

Preservice teachers with teaching confidence can handle more difficult situations in a classroom, reach various levels of learners, make a difference in learning outcomes (Darling-Hammond et al., 2002), and have lower attrition rates (Ingersoll, Merrill et al., 2014). Preservice teachers who feel prepared to teach exhibit a higher level of instructional or teaching self-efficacy (Henson, 2001).

Table 1. Sources to Gain Self-Efficacy and simSchool Activities

Sources to gain a sense of self-efficacy	simSchool activities
Successful repetition of task	Preservice teachers practice how to: Repeat lessons Adjust teaching Analyze findings
Social modeling through the observation of others completing a task	Preservice teachers observe: Trainer models effective teaching Peers model simSchool task Completions
Social persuasion by competent others instilling confidence with encouragement to succeed	Preservice teachers are encouraged by: Simulation feedback Peer feedback Trainer feedback
Situations for others to succeed through self-improvement	Preservice teachers develop ways to: Make classroom decisions Adjust mistakes Repeat lessons Connect virtual teaching to authentic teaching

The 2007–2008 Schools and Staffing Survey (SASS) identified 24% of the nation's teaching workforce as beginning teachers with 5 or fewer years of teaching experience. Of the roughly 832,000 beginning teachers identified, 61% experienced 12 or more weeks of practice teaching, while 20% had less than 12 weeks of practice teaching and 19% had no practice teaching. Support for the new teachers in their first year varied from induction programs to common planning time with peer teachers, seminars for beginning teachers, extra classroom assistance, guidance from a mentor, and regular communication with the principal. Feedback from the new teachers reported their sense of preparedness in six areas:

- 59% felt well prepared to handle classroom management.
- 71% felt well prepared using a variety of instructional methods.
- 83% felt well prepared in teaching subject matter.
- 67% felt well prepared in using computers.
- 70% felt well prepared in assessing students.
- 65% felt well prepared in adapting curriculum and instructional materials.

These data indicate that significant percentages of teachers felt unprepared to teach in various areas necessary for effective teaching.

The "bright-person" myth (Darling-Hammond, 2000) supposes that anyone can teach knowledge to someone else, regardless of whether one has received teacher training or is well prepared. However, Darling-Hammond presumes that when a teacher is trying to convey a lesson to a learner, and the learner does not understand the lesson, the teacher may become frustrated and unable to proceed with the lesson because the teacher may lack the training to reteach using a different pedagogical strategy. This lack of ability to engage students with a new strategy may lead to resentment from the student, who feels the teacher is not displaying sufficient effort. Without adequate practice teaching that provides experiences in using various effective interventions during teacher training, it may be difficult for a new teacher to select from a range of effective strategies to teach students who are experiencing initial difficulty with comprehension of a lesson.

simSchool Model Scenarios

simSchool promotes pedagogical expertise by re-creating the complexities of classroom decisions through mathematical representations of how people learn and what teachers do when teaching. The model includes research-based psychological, sensory, and cognitive domains similar to Bloom's Taxonomy of Educational Objectives (Bloom, Mesia, & Krathwohl, 1964). However, in simSchool these domains are defined with underlying subcategory factors that reflect modern psychological, cognitive science, and neuroscience concepts. For example, the Five-Factor Model of psychology (McCrae & Costa, 1996) serves as the foundation of the student personality spectrum. This model includes the following characteristics: extroversion, agreeableness, persistence, emotional stability, and intellectual openness to new experiences. For each of these five factors a continuum from –1 to +1 is used to situate the learner's specific emotional processing propensities, which can shift as the context of the classroom changes. A simplified sensory model with auditory, visual, and kinesthetic perceptual preferences comprises the physical domain. A flexible single factor is used to represent a specific academic domain. Together, the physical, emotional, and academic factors are used to represent salient elements of classroom teaching and learning (D. Gibson, 2007; Christensen et al., 2011).

Through the navigation of a technology-based platform, preservice teachers complete mini-scenarios that provide a holistic view of teaching and allow preservice teachers to hone in on specific teaching strategies such as classroom management and differentiated instruction. Grounded in educational theory, preservice teachers complete simSchool modules to make decisions about virtual students and practice teaching lessons to critically challenge students using higher ordered thinking skills. simSchool provides feedback reports on teaching sessions for preservice teachers to analyze the effectiveness of their teaching and make adjustments to improve student achievement. The adjusted lesson is repeated in the simulator, and preservice teachers compare and contrast student outcomes based on their instructional decisions. This type of feedback and improvement cycle develops pedagogical

knowledge about teaching using theoretical and practical experience (D. Gibson & Kruse, 2012).

Table 2. Survey of Teaching Skills Experience and Confidence Level Measurement Scale

Experience level	Very low	Moderately low	Medium	Moderately high	Very high
Confidence level	Very low	Moderately low	Medium	Moderately high	Very high

Methods

Instrumentation for Measurement of Pedagogical Balance

Pedagogical balance is a new measure created with the support of grants awarded by the U.S. Department of Education Fund for the Improvement of Postsecondary Education (FIPSE), the Gates/EDUCAUSE Foundation, and the National Science Foundation to assess alignment of perceived confidence and experience. The Survey of Teaching Skills (D. Gibson, Riedel, & Halverson, 2006) is a self-report of preservice teachers' self-efficacy and divides the construct into two variables, teaching confidence and teaching experience. Preservice teachers assess their experience and confidence levels using a five-item scale that ranges from very low to very high, as shown in Table 2 (see the appendix to view the entire survey). Using this instrument, self-efficacy is measured by the summation of confidence and experience, while pedagogical balance is measured by the difference score between confidence and experience.

The survey addresses eight teaching areas as described in Table 3.

Pedagogical balance is defined as the difference between a person's average confidence rating for teaching and average experience rating for teaching (Hopper et al., 2013; Hopper et al., 2014). The lowest rating on the survey used for examining pedagogical balance is 1.0 for each measure, while the highest is 5.0, so the greatest possible difference between

Table 3. Eight Areas of Teaching Areas Measured in the Survey of Teaching Skills in simSchool

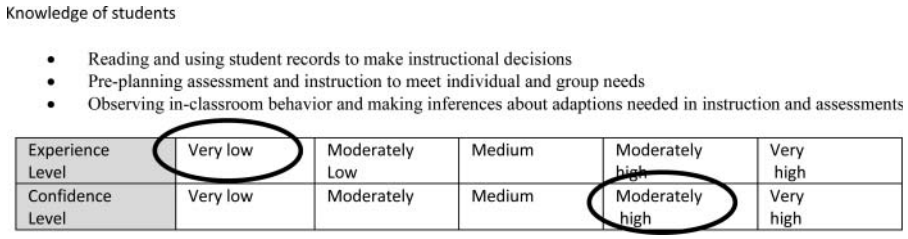
Teaching area	Description
Knowledge of students	Reading and using student records to make instructional decisions
	Preplanning assessment and instructions to meet individual and group needs
	Observing in-classroom behavior and making inferences about adaptations needed in instruction and assessments
Preplanning instruction	Knowing what subject one is prepared to teach
	Knowing how many and what kinds of tasks are suited and fit with a subject
	Estimating the number of class sessions to teach a particular set of tasks
Making and using tasks	Designing appropriate tasks
	Sequencing tasks for best effect
Making and using assessments	Assigning assessment items to a given objective
	Estimating the number of and types of assessment items' measures are suited to and fit for a particular set of objectives
	Understanding the data produced by administration of pre-assessment
Replanning instruction	Prior to instruction, choosing whole-class instructional strategies based on (aligned with) pre-assessment results
	Prior to instruction, choosing individual instructional strategies based on (aligned with) student records and individual pre-assessment results
Classroom decision making	Interpreting in-class performance (on-task vs. off-task behaviors) as academic vs. emotional issues
	"Reading" students via participation clues and language
	Speaking to students in effective and appropriate ways
	Grouping students for differentiated instruction
	Adjusting instructional strategies based on in-class performance
	Individualizing tasks
	Focusing talk and discussion on improved student performance
Making and using postassessment	Designing appropriate and aligned test items to assess a given "unit of study" (objectives plus instructional strategies and adaptations that have occurred during a number of class sessions)
	Estimating the number of and types of assessment items' measures are suited to and fit for the unit of study
	Understanding the data produced by administration of a postassessment
Reflections on teaching	Making mental notes (and possibly written records such as grade-book notations) about the evolution of a particular unit of study—the interactions of one's plans with the realities of teaching
	Abstracting and articulating lessons learned from the whole experience

confidence and experience is 4.0. The basic principle underlying the idea of balance is that a difference score should equal 0.0 when the confidence of a preservice teacher is aligned with his or her experience (Hopper et al., 2013).

For example, teacher A perceives a low level of experience and a high level of confidence in knowledge of students (Figure 1). If teacher A has little experience in knowledge of students, then why is that teacher's confidence so high? While the teacher may perceive that he or she is prepared in an area of teaching, the self-report indicates that the teacher lacks experience in working in that area. This example indicates an "overconfident" imbalance of confidence over experience.

In the next example, Figure 2 illustrates teacher B's report of high experience and low confidence, which demonstrates an "underconfident" imbalance. Although this teacher may have a moderately high level of experience with students, he or she has not yet gained in confidence from that experience.

The third example in Figure 3 illustrates a balance of experience and confidence. Teacher C perceives that the confidence and experience levels in knowledge of students are equal. The teacher may perceive pedagogical balance in a teaching area when his or her confidence level aligns with his or her level of experience.


Knowledge of students

- Reading and using student records to make instructional decisions
- Pre-planning assessment and instruction to meet individual and group needs
- Observing in-classroom behavior and making inferences about adaptions needed in instruction and assessments

Experience Level	Very low	Moderately Low	Medium	Moderately high	Very high
Confidence Level	Very low	Moderately	Medium	Moderately high	Very high

Figure 1. Example of reported low experience and high confidence from the survey of teaching skills.

Analysis

This study executed a quasi-experimental design to quantitatively measure and examine preservice teachers' perceived levels of teaching confidence, teaching experience, and pedagogical balance before and after using simSchool. Reliability measures, descriptive statistics, a paired-samples *t*-test, and multiple analysis of variance (MANOVA) were used to analyze the data. Descriptive statistics including mean and standard deviations for the Survey of Teaching Skills data were computed for confidence and experience at pretest and posttest for Study 1 and Study 2. A paired-samples *t*-test was computed to determine gains in confidence and experience from pre- to posttest. MANOVA was computed to determine whether changes in preservice teachers' confidence, experience, and pedagogical balance were different between preservice teachers who used simSchool as a training tool and those who did not. MANOVA was used in which treatment and comparison functioned as the attribute variables. The findings for confidence and experience are examined in two different studies. Pedagogical balance is explored by comparing the two studies side by side.

Study 1

Sample

In the fall of 2012, 58 preservice teachers from an undergraduate technology integration course at a large Southwestern university participated in Study 1. The treatment group consisted of 31 students and the comparison group included 27 preservice teachers from a different section of the technology integration course with no experience in simSchool. The technology integration course introduced preservice teachers to the field of educational technology. Topics covered in the course were those that impacted educators working in the classroom environment.

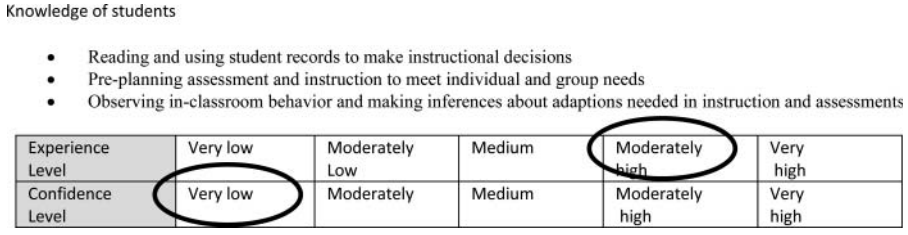
Instrument Reliability and Validity

The Survey of Teaching Skills was administered to the treatment and comparison groups as a pre- and posttest. Cronbach's alpha for Experience Level was .96, and for Confidence Level was .94. According to the guideline by DeVellis (1991), both Cronbach's alpha scores were excellent, indicating high internal consistency reliability for each measurement index.

Intervention

The simSchool treatment took place midway through the semester during the scheduled course meeting times, 3 out of 4 weeks. The pretest was administered to the treatment group prior to the simSchool training.

Preservice teachers in the treatment group participated in 8 hours of simSchool incorporating three training sessions. The training occurred with modules on the Big Five Factor model of personality (McCrae & Costa, 1996), Bloom's Taxonomy (Bloom et al., 1964) of higher order thinking skills, and student-centered instruction. The goal in Session 1 was to introduce preservice teachers to simSchool and to connect personality traits with teaching and learning style. Learning objectives for the module were for preservice teachers to


Knowledge of students

- Reading and using student records to make instructional decisions
- Pre-planning assessment and instruction to meet individual and group needs
- Observing in-classroom behavior and making inferences about adaptions needed in instruction and assessments

Experience Level	Very low	Moderately Low	Medium	Moderately high	Very high
Confidence Level	Very low	Moderately	Medium	Moderately high	Very high

Figure 2. Example of reported high experience and low confidence from the survey of teaching skills.

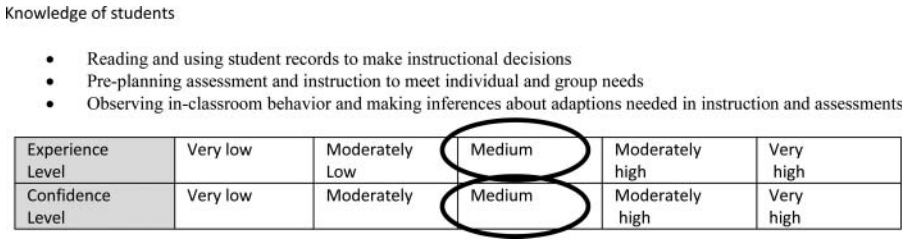


Figure 3. Example of equal experience and confidence levels from the survey of teaching skills.

realize that every student learns differently. Experiential interactions between the teacher and the virtual students were to provide inquiry-based activities to assist preservice teachers in the discovery of new teaching strategies. Session 2 built upon the skills that the preservice teachers learned in Session 1 to consider how student personality traits influence student academic outcomes of teacher-planned lessons. The learning objectives in Session 2 were to structure activities that engage and challenge the learner through the use of curriculum resources to purposefully create lessons that guide and direct student learning and behavior impacting academic achievement.

In Session 3 of simSchool training, preservice teachers compared and contrasted the learning outcomes of a student-centered lesson on endangered eagles with a teacher-centered lesson on the same content. This module modeled examples of higher order thinking activities using different types of pedagogical practice with technology integration. Students worked in groups to create a digital storytelling project on a topic of their choosing to analyze their group's perception and their own perception of a student-centered lesson compared to a teacher-centered lesson.

The comparison group continued to participate in previously established classroom activities. They completed their pretest surveys at the same time as the treatment group, midway through the semester, with their posttest 1 month later.

Findings

Treatment classroom. The mean differences pre- to posttest within the treatment group were examined using a paired-sample *t*-test. Significant gains ($p < .005$) in experience ($d = .97$) and confidence ($d = .76$) from pre- to posttest (Cohen, 1988) are shown in Table 4.

Comparison classroom. The comparison group demonstrated significant gains ($p < .05$) in experience ($d = .33$, $p = .006$) and confidence ($d = .58$, $p < .0005$) from pre- to posttest with educationally meaningful effect sizes (Bialo & Sivin-Kachala, 1996), as shown in Table 5.

The effect sizes were much smaller for the comparison group than for the treatment group, warranting further analysis using MANOVA to explore the consistency of the simSchool treatment between all subjects. The MANOVA test results showed the pre to post gains for the treatment group to be higher than for the comparison group, and the gains in experience ($p = .036$) were significantly higher. These findings shown in Figures 4 and 5 suggest that 8 hours of simSchool intervention increased the ratings of experience in preservice teachers and the training can be considered to be educationally meaningful (Bialo & Sivin-Kachala, 1996).

Study 1 results found that confidence in both the treatment and comparison groups increased nearly at the same rate, whereas experience of the treatment group increased significantly ($p = .036$) more than the comparison group.

Table 4. Paired-Sample *t*-Test for the Treatment Classroom Study 1 Using simSchool, Technology Integration Course, Fall 2012

Measuring indices		*N*	Mean	*SD*	Significance	Cohen's *d*
Experience	Pre	31	2.50	0.80	.00	0.97
	Post	31	3.20	0.64		
Confidence	Pre	31	2.80	0.82	.00	0.76
	Post	31	3.30	0.49		

Study 2

Sample

Undergraduate students from two different teaching preparation courses at a large southwestern university participated in Study 2 in the fall of 2013. The treatment group consisted of 36 participants in the pretreatment group and 37 participants in the posttreatment group. Preservice teachers enrolled in a technology integration course (described in Study 1) participated in 6 hours of simSchool with the same instructor as part of the course curriculum. The comparison group consisted of 80 participants at pretest time and 77 participants for posttest data collection. Participants in the comparison group were enrolled in a required education course on teaching exceptional learners. The treatment and comparison groups completed a pretest of the Survey of Teaching Skills 2 weeks into the semester. The online pretest was completed by the comparison group from five sections of the teaching exceptional learners course. The comparison students were offered extra credit to participate in the study. The posttest was completed by the treatment and comparison groups approximately 1 month from the completion of the pretest.

Instrument Reliability and Validity

Cronbach's alpha for Experience Level was .93, and for Confidence Level was .93. Both Cronbach's alpha scores were excellent, indicating high internal consistency reliability for each measurement index according to the guidelines by DeVellis (1991).

Table 5. Paired-Sample *t*-Test Comparison Classroom Study 1 Using simSchool, Technology Integration Course, Fall 2012

Measuring indices		*N*	Mean	*SD*	Significance	Cohen's *d*
Experience	Pre	27	2.73	0.86	.0006	0.33
	Post	27	3.00	0.78		
Confidence	Pre	27	3.03	0.71	.00	0.58
	Post	27	3.44	0.71		

Intervention

The intervention for Study 2 consisted of 6 hours of simSchool training. The training was comprised of Session 1 and Session 2 described in Study 1. Session 3 was not administered in Study 2. The same instructor taught the simSchool training in both studies.

Findings

Treatment classroom. The mean differences pre- to posttest were examined using a paired sample *t*-test. The treatment group experience ($p = .003$) showed significant gains ($p < .05$) from the pre- to posttest with the simSchool intervention, whereas the treatment group confidence was not significant, as shown in Table 6. A moderate effect size for gains ($d = .62$) in experience was found according to the guidelines provided by Cohen (1988). The effect of simSchool can be considered to be educationally meaningful according to guidelines published by Bialo and Sivin-Kachala (1996).

Comparison classroom. The comparison group did not demonstrate significant gains ($p = .99$) from pre- to posttest and the effect sizes were insignificant, as shown in Table 7. Additional analysis using MANOVA to examine the consistency of the simSchool treatment between all subjects was computed. The MANOVA test results showed the pre to post gains for the treatment group to be higher than for the comparison group, and the gains in experience were significantly higher ($p = .044$). These findings shown in Figures 6 and 7 suggest that 6 hours of simSchool intervention increased the ratings of experience in preservice teachers.

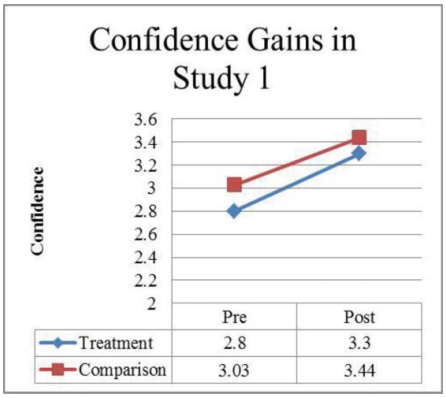


Figure 4. Confidence for the treatment and comparison groups increased at the same rate (not statistically significant, $p = .95$).

Comparison of Study 1 and Study 2

Findings concerning experience were significant in the pre to post gains in Study 1 for the treatment and comparison groups. In Study 2, experience was found to be statistically significant ($p < .05$) for the treatment group. The differences in these findings between the two studies may be attributed to several reasons. First, the course selection of the comparison groups in each study was different. In Study 1 both the treatment and the comparison groups were from a technology integration course for preservice teachers. Study 1 took place midway through the semester, so the comparison group could have gained in experience and confidence from pre- to posttest from quality course instruction. In Study 2, the comparison group was selected from a required education course on teaching exceptional learners. The results found that effectively no change took place in confidence or experience for the comparison group in Study 2 from pre- to posttest. These students had not taken the technology integration course so they did not gain from learning in technology integration. Another difference between the two studies was that the treatment group in Study 1 participated in 8 hours of simSchool, whereas the treatment group in Study 2 participated in 6 hours of simSchool. The two additional hours of simSchool training of the Study 1 participants may have impacted confidence or experience levels in the treatment group. Further research is needed to determine to what degree more simSchool training provides increased results. Both the course selection of the participants in the studies and the number of simSchool hours participants trained should be considered in comparing Study 1 and Study 2. The authors propose another possibility for the findings. Further clarification of these gains may result from examination of the measure of pedagogical balance because the significant gains in experience become more relevant with consideration of the results of confidence.

Pedagogical Balance for Study 1 and Study 2

The mean differences from pretest to posttest were examined for pedagogical balance in Study 1 using a paired-sample *t*-test with $n = 31$ in the treatment group and $n = 27$ in the comparison group. The mean of pedagogical balance of the treatment group significantly improved by moving closer to zero ($p < .05$) from the pretest ($x = .38$) to the posttest ($x = .10$). Note that by becoming closer to zero, pedagogical balance increased as

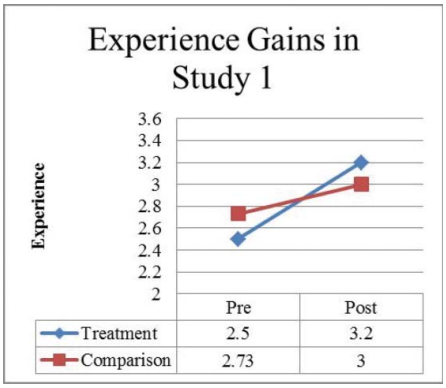


Figure 5. Experience for the simSchool treatment group increased at a greater rate than the comparison group (statistically significant, $p = .036$).

Table 6. Paired Sample *t*-Test for the Treatment Classroom Study 2 Using simSchool, Technology Integration Course, Fall 2013

Measuring indices		*N*	Mean	*SD*	Significance	Cohen's *d*
Experience	Pre	36	2.88	0.78	.003	0.62
	Post	37	3.32	0.64		
Confidence	Pre	36	3.18	0.64	.164	0.29
	Post	37	3.36	0.61		

confidence and experience became more aligned. In contrast, the mean of pedagogical balance of the comparison group significantly ($p < .05$) became less balanced from the pretest ($x = .30$) to the posttest ($x = .44$), signified by the score mean migrating further from zero, indicating that confidence and experience became less aligned. Both the treatment ($d = .46$) and comparison ($d = .33$) groups were found to have medium effect sizes in pedagogical balance (Cohen, 1988), as shown in Table 8.

Study 2 had pedagogical balance results similar to the treatment and comparison groups found in Study 1. The mean differences as shown in Table 9 of the treatment group improved by decreasing from pretest ($x = .27$) to posttest ($x = .01$), whereas the comparison group worsened by showing increases in the mean differences from pretest ($x = .25$) to posttest ($x = .33$). Pedagogical balance became closer to zero for the treatment group and further away for the comparison group, which suggests that the simSchool intervention provided training that improved the balance of preservice teachers' confidence and experience. The treatment group's pedagogical balance showed significant improvement ($p < .005$) and a moderately large effect size ($d = .59$), whereas the comparison group showed a slight trend toward less balance ($p = .22$) with a low effect size ($d = .12$).

The MANOVA test results illustrated in Figures 8 and 9 showed the pre to post movement for the treatment groups to be toward greater pedagogical balance, while for the comparison groups the pre- to posttest movement was toward being more out of balance. The difference was statistically significant in Study 1 ($p = .031$) and Study 2 ($p = .033$). These findings suggest that the differences between confidence and experience became more aligned in both studies as a result of the simSchool intervention. Pedagogical balance significantly improved for both treatment groups by moving closer to zero; however, pedagogical balance for the two comparison groups moved further away from zero. The members of the treatment group became more aligned in the difference between their confidence ratings and experience ratings during their simSchool training. Overall, preservice teachers using simSchool significantly increased in experience and pedagogical balance.

Summary of Findings

The results of Study 1 and Study 2 had similar findings. Both studies found insignificant pre- to posttest gains in confidence, and significant pre- to posttest gains in experience and pedagogical balance.

Table 7. Paired Sample t-test for the Comparison Classroom Study 2 using simSchool, Technology Integration Course, Fall 2013

Measuring indices		*N*	Mean	*SD*	Significance	Cohen's *d*
Experience	Pre	80	2.60	0.90	.99	0.01
	Post	77	2.61	0.83		
Confidence	Pre	80	2.90	0.88	.951	0
	Post	77	2.90	0.83		

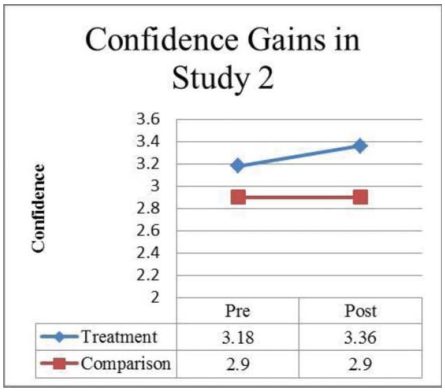


Figure 6. Pre- to post- gains in confidence for the simSchool treatment group increased at varied rates (not statistically significant, $p = .63$).

Finding for Changes in Confidence

The first research question addressed the effectiveness of simSchool training for the treatment group and found that preservice teachers trained in 6 to 8 hours of simSchool did not show significantly higher pre- to posttest gains in teaching confidence than those without the training.

Finding for Changes in Experience

The second research question addressed the effectiveness of simSchool training for the treatment group and found that preservice teachers trained in 6 to 8 hours of simSchool showed higher pre- to posttest gains in teaching experience than those without the training.

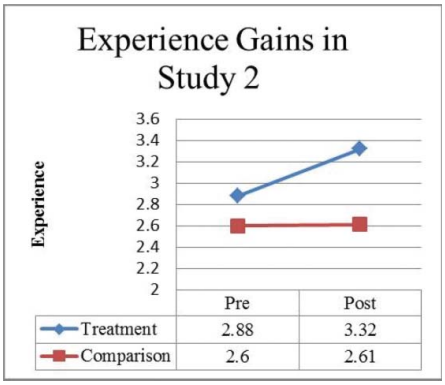


Figure 7. Pre- to post- gains in experience for the simSchool treatment group increased at a greater rate than the comparison group (statistically significant, $p = .044$).

Table 8. Pedagogical Balance Findings From Study 1 Treatment and Comparison Groups, Technology Integration Course, Fall 2012

Variable	Test	*n*	*x*	*s*	*p*	*d*
Treatment pedagogical balance	Pre	31	.38	.73	.05	.46
	Post	31	.10	.41		
Comparison pedagogical balance	Pre	27	.30	.34	.00	.33
	Post	27	.44	.49		

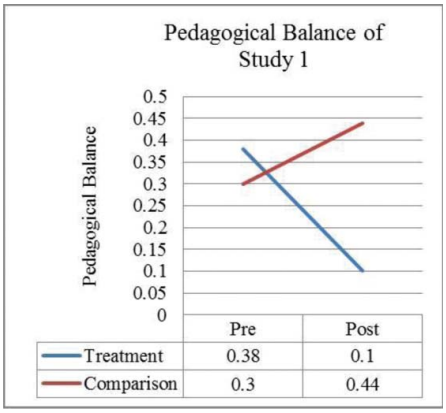


Figure 8. Pedagogical balance for the comparison group became more out of balance (further away from 0); however, the simSchool treatment group improved pedagogical balance (closer to 0) (statistically significant, $p = .031$).

Finding for the Balance Between Confidence and Experience

The third research question addressed the effectiveness of simSchool training for the treatment group and found that preservice teachers trained in 6 to 8 hours of simSchool showed higher pre- to posttest improvements in pedagogical balance than those without the training.

Discussion

In Study 1 ($p = .036$) and Study 2 ($p = .044$) preservice teachers significantly gained in experience from their involvement with simSchool, while confidence ratings were not significant. One reason the confidence ratings may not have been significant was that preservice teachers may have overrated their confidence levels when self-reporting their perceptions on the pretest, as the theory of action (Argyris & Schoen, 1974) suggests. Typically, with the espoused theory one reports how one would like to behave based on one's personal values. After the simSchool intervention, preservice teachers may have realized that they were not as confident about teaching as they believed they were before their experience in simSchool. Prior to the simSchool experience, during the completion of the pretest, preservice teachers appear to have utilized the espoused theory reporting higher confidence in their teaching ability. However, after the simSchool training it appears the theory in use was predominant. The preservice teachers may have reported lower confidence at the posttest because the simSchool treatment provided teaching experience, perhaps allowing the preservice teachers to realize they did not know as much as they thought they knew about teaching prior to their simSchool experience. simSchool training may have provided awareness to preservice teachers of some of the skills needed to teach that they had not yet developed. Although confidence decreased from pre- to posttest, it appears that the gap between what preservice teachers believed they could do and what they actually were able to do lessened due to their gain in awareness of their own abilities (or lack thereof).

The findings for pedagogical balance in Study 1 ($p = .031$) were similar to the results in Study 2 ($p = .033$). The graphs (Figures 8 and 9) illustrate consistent results in that experience and confidence became more aligned in the treatment group, whereas the comparison group became more out of balance. Confidence may have decreased, but as previously stated the confidence self-report may have been somewhat inflated at the pretest. To counteract the decrease in confidence, experience increased, causing improved alignment in pedagogical balance.

Table 9. Pedagogical Balance Findings From Study 2 Treatment Technology Integration Course and Comparison Exceptional Learner's Course, Fall 2013

Variable	Test	*n*	*x*	*s*	*p*	*d*
Treatmentpedagogical balance	Pre	34	.27	.56	.00	.59
	Post	34	.01	.25		
Comparisonpedagogical balance	Pre	75	.25	.66	.22	.12
	Post	75	.33	.69		

Conclusions and Implications of Findings

The results of these research studies support the following conclusions:

- Preservice teachers may overrate their confidence levels at pretest time.
- Preservice teachers seem to gain teaching experience in simSchool.
- Experience and confidence measures seemed to become more balanced as a result of simSchool use.
- Preservice teachers seem to gain awareness of their teaching skills (or lack of) through the use of simSchool.

Study 1 and Study 2 provide evidence that simSchool training offered the preservice teachers additional paths to

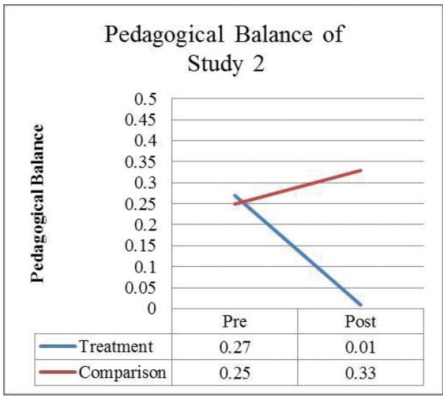


Figure 9. Pedagogical balance for the comparison group became more out of balance (further away from 0); however, the simSchool treatment group improved pedagogical balance (closer to 0) (statistically significant, $p = .033$).

practice and improve teaching skills, connected learning theories in the classroom, and developed experience without the ill impacts of practicing on real students. In addition, findings indicate that 6 to 8 hours of purposeful activities in the simulator may improve pedagogical balance through the alignment of confidence and experience.

Based on the findings of Study 1 and Study 2, pedagogical balance holds potential for future use as a proficiency indicator for preservice teachers, to enable them to understand their individual alignment of confidence and experience. This knowledge could increase awareness of the skills that preservice teachers need to develop to be effective teachers, and help to bridge the gap between what preservice teachers espouse to know and what they actually know.

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Appendix: Survey of Teaching Skills (Gibson, Riedel, & Halverson, 2006)

Survey of Teaching Skills

Knowledge of students

- Reading and using student records to make instructional decisions
- Pre-planning assessment and instruction to meet individual and group needs
- Observing in-classroom behavior and making inferences about adaptations needed in instruction and assessments

Experience Level	Very low	Moderately low	Medium	Moderately high	Very high
Confidence Level	Very low	Moderately low	Medium	Moderately high	Very high

Pre-planning instruction

- Knowing what subject one is prepared to teach
- Knowing how many and what kinds of tasks are suited and fit with a subject
- Estimating the number of class sessions needed to teach a particular set of tasks

Experience Level	Very low	Moderately low	Medium	Moderately high	Very high
Confidence Level	Very low	Moderately low	Medium	Moderately high	Very high

Making and using tasks

- Designing appropriate tasks
- Sequencing tasks for best effect

Experience Level	Very low	Moderately low	Medium	Moderately high	Very high
Confidence Level	Very low	Moderately low	Medium	Moderately high	Very high

Making and using assessments

- Aligning assessment items to assess a given objective
- Estimating the number of and what kinds of assessment items/measures are suited and fit for a particular set of objectives
- Understanding the data produced by administration of a pre-assessment

Experience Level	Very low	Moderately low	Medium	Moderately high	Very high
Confidence Level	Very low	Moderately low	Medium	Moderately high	Very high

Re-planning Instruction

- Prior to instruction, choosing whole-class instructional strategies based on (aligned with) pre-assessment results
- Prior to instruction, choosing individual strategies based on (aligned with) student records and individual pre-assessment results.

Experience Level	Very low	Moderately low	Medium	Moderately high	Very high
Confidence Level	Very low	Moderately low	Medium	Moderately high	Very high

Classroom decision-making

- Interpreting in-class performance (on task vs off task behaviors) as academic vs emotional issues
- "Reading" students via participation clues and language
- Speaking to students in effective and appropriate ways
- Grouping students for differentiated instruction
- Adjusting instructional strategies based on in-class performance
- Individualizing tasks
- Focusing talk and discussion on improved student performance

Experience Level	Very low	Moderately low	Medium	Moderately high	Very high
Confidence Level	Very low	Moderately low	Medium	Moderately high	Very high

Making and using a post-assessment

- Designing appropriate and aligned test items to assess a given "unit of study" (objectives plus the instructional strategies and adaptations that have occurred during a number of class sessions)
- Estimating the number of and what kinds of assessment items/measures are suited and fit for the unit of study
- Understanding the data produced by administration of a post-assessment

Experience Level	Very low	Moderately low	Medium	Moderately high	Very high
Confidence Level	Very low	Moderately low	Medium	Moderately high	Very high

Reflections on teaching

- Making mental notes (and possibly written records such as grade book notations) about the evolution of a unit of study – the interaction of one's plans with the realities of teaching
- Abstracting and articulating lessons learned from the whole experience

Experience Level	Very low	Moderately low	Medium	Moderately high	Very high
Confidence Level	Very low	Moderately low	Medium	Moderately high	Very high